What is claimed is:

1. An integrated circuit comprising a fine vacuum tube element and other electronic elements integrated and formed on a substrate of a semiconductor or the like, the fine vacuum tube element and the other electronic elements transmitting signals to and from each other.

2. The integrated circuit as claimed in claim 1, wherein when integrating the vacuum tube element with the other electronic elements, a quantum effect is realized in a room temperature environment by utilizing ballistic electrons (non-scattering electrons) traveling through the vacuum.

3. The integrated circuit as claimed in claim 1 or 2, wherein an interference system such as a Mach-Zehnder interferometer is constructed and an A/D converter is constructed.

4. The integrated circuit as claimed in claim 1 or 2, wherein an interference system such as a Mach-Zehnder interferometer is constructed and weighting of the Mach-Zehnder interferometer is constituted for image processing and signal code conversion to realize an advanced function-integrated type.

5. The integrated circuit as claimed in claim 1 or 2, wherein a very high-speed light-receiving integrated circuit for optical communication is constructed by utilizing a very high-speed optical response characteristic of electron

emission of the vacuum element.

6. The integrated circuit as claimed in claim 1 or 2, wherein a sensor such as a magnetic/electric field sensor is constructed by utilizing a quantum effect of ballistically traveling electrons.

7. The integrated circuit as claimed in one of claims 1 to 6, wherein a thermionic cathode is used as a cathode of the vacuum element.

8. The integrated circuit as claimed in claim 7, wherein LaB6 (lanthanum hexaboride) or carbon nanotube is attached to the thermionic cathode.